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KARYOTYPE ANALYSIS IN *PROTEA* L.

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(With Plate XI)

Studies of the karyotype have often been found useful if comparative relationships are to be made within and between species. One of the best examples of this is the genus *Crepis*. Morphological criteria of chromosomes are, *inter alia*, used by cyto-taxonomists for purposes of identification and establishing systematic relationships, since the karyotype has long since been recognized as a definite species character (Swanson, 1957).

Certain difficulties in the classification of South African *Protea* spp. suggest the use of chromosome studies as an aid to taxonomy. Up to now only de Vos (1943) has undertaken such studies. These studies led to a knowledge of the basic chromosome number and also established the existence of differences in the size of mitotic chromosomes and in the position of the centromere. But since then no attempt has been made to analyse the karyotype of *Protea* spp. in detail. This may be due to the belief that such an analysis, as expressed by Vogts (1960), is not considered a very profitable undertaking because of the chromosome size and possibly other factors.

In view of this situation, some attention was given as early as 1956 to the morphology of meiotic and mitotic chromosomes, during routine cytological investigations concerned with breeding research on Proteaceae. Pollen mother-cells were fixed in 1 : 3 acetic alcohol and stained in 0.25% acetocarmine containing 1.5% of a 10% FeCl_3 solution for 24 hours.

Root-tips of seedlings were pre-treated for 2 to 3 hours at 25°C in a saturated solution of monobromonaphthalene (O'Mara, 1948), fixed and stained in 1% propionic-carmin (Swaminathan, Magoon & Mehra, 1954) for 24 hours at room-temperature, treated with pectinase, as described by Pienaar (1955), and squashed.

The chromosome number of $n = 12$, as reported by de Vos (1943) was confirmed for the following additional species: *P. cedromontana*, *P. compacta*, *P. incompta*, *P. laticolor*, *P. latifolia*, *P. longiflora*, *P. longifolia*, *P. minor*, *P. mundii*, *P. pulchella* and *P. rosacea*. The pairing of chromosomes in diakinesis was perfect in *P. arborea* and in *P. barbigera*, the mean number of chiasmata being 0.84 ± 0.007 per chromosome. In pachytene, a stage which is pre-eminently suitable for chromosome-morphological studies, all chromosomes were found to be partially hetero-chromatic and distinguishable morphologically. Though no detailed analysis of pachytene chromosomes was carried out it became clear that pachytene in *Protea* is no doubt suitable for studies of chromosome-morphology.

In mitosis, late prophase and early metaphase were found to be the stages most suitable for such studies. Fig. 1 gives a preliminary idiogram of *P. cedromontana*, prepared from camera lucida drawings of these stages, while Plate XI is a microphotograph of late prophase in *P. latifolia*. Primary and secondary constrictions can be distinguished without difficulty. The absolute length of the longest chromosome amounts to five microns while that of the shortest is 2.2 microns. There are two pairs of long chromosomes with subterminal centromeres, three pairs of short chromosomes with median centromeres, while the remaining pairs are of medium length with submedian or subterminal centromeres.

From these results it has become clear, that the chromosomes of *Protea* are neither too small nor in any other way unsuitable for a detailed morphological study and that they lend themselves very readily to simple cytological techniques.

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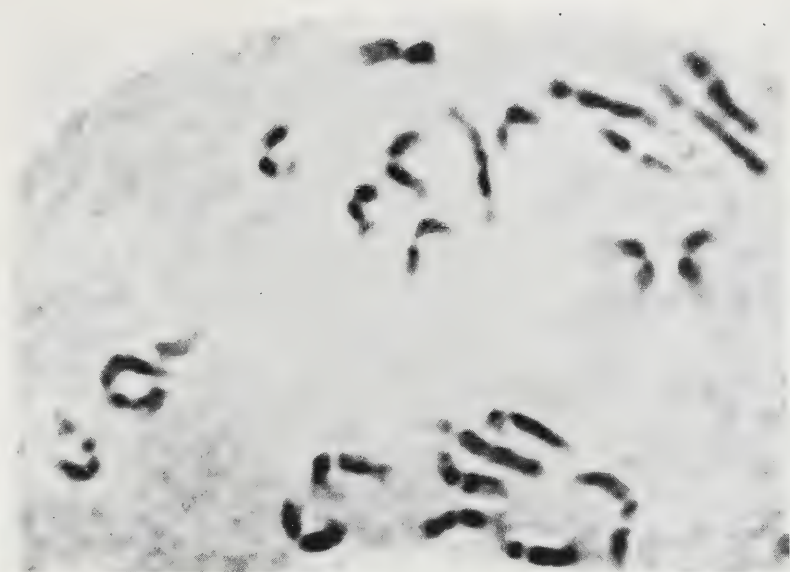


PLATE XI

FIG. 1.—Photomicrograph of late prophase in *P. latifolia*.

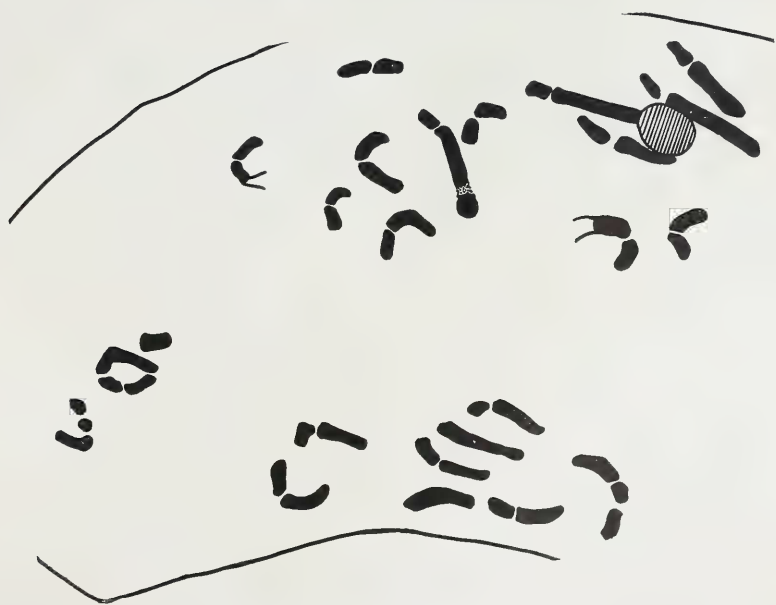


FIG. 2.—Diagram of late prophase in *P. latifolia*.



FIGURE 1.—Chromosome idiogram of *Protea cedromontana*.